Battery energy storage project shows promise for electricity network

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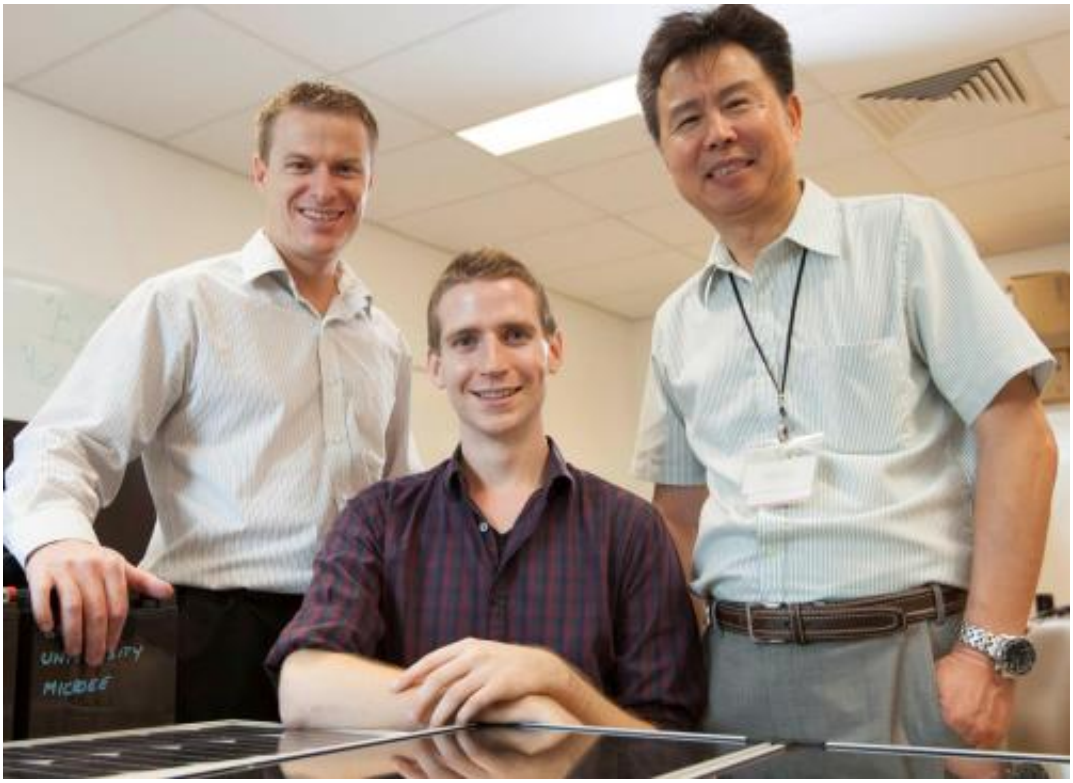

From left are: Griffith University's Associate Professor Rodney Stewart, researcher Mr. Chris Bennett and Professor Jun Wei Lu. Credit: Griffith University

With rising electricity prices one of the biggest issues facing households, Griffith University (Australia) research into energy storage and supply holds the promise of cheaper, better quality power for the low voltage

(LV) electricity distribution network.

According to the research from Griffith's School of Engineering and published in the journal *Applied Energy*, a forecast-based, three-phase battery energy storage scheduling and operation system provides benefits such as reduced peak demand, more efficient load balancing and better management of supply from solar photovoltaics (PV).

Researcher Mr Chris Bennett, working under the supervision of Associate Professor Rodney Stewart and Professor Jun Wei Lu, has developed and applied an intelligent scheduling system to a South-East Queensland-based LV distribution network servicing 128 residential customers.

"The low voltage network is a typical suburb of a few hundred homes where there is a single area transformer and recently there has been a substantial increase in the number of homes with installed residential solar PV in these settings," says Mr Bennett.

"Daily peak demand in residential networks typically occurs in the evenings in summer and both late morning and evening in winter. But because solar PV generation is dependent on incoming solar radiation, peak generation occurs during the middle of the day, typically when demand in the residential distribution network is low."

"This means there is an incongruity between when energy is generated and when it is required, which can lead to power supply and quality issues.

"However, with a battery energy storage (BES) system comprising Lithium Ion battery banks coupled with smart power control systems, such as STATCOMS, and featuring embedded intelligent forecasting software, we can better manage the LV network."

Associate Professor Stewart says the recent significant uptake of solar PV has in some locations created issues in the LV network, including surplus power being pushed up the grid, unbalanced phases and poor power quality.

"Our solution tackles these immediate issues while also setting the foundation for a future smart grid," he says.

"The two main advantages of intelligent BES in the LV network are that we can mitigate power quality issues attributed to fluctuations in generation from renewable energy sources such as PV, and we can store surplus energy gathered during the middle of the day and distribute it when it is needed in the evening peak period.

"If such a system was implemented across an entire city it would reduce wholesale peak generation charges, alleviate costly upgrades to the grid, reduce the average time of outages and improve power quality for customers."

Associate Professor Stewart and Mr Bennett agree that distributed energy resources and smart power control electronics can revolutionise the grid and reduce the price of electricity for customers.

More information: *Applied Energy*, www.sciencedirect.com/science/… ii/S0306261915001841

Provided by Griffith University